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S3	22	("3429040"   "3517279"   "3770874"   "3887760"   "4034467"   "4164778"   "4893216"   "5192835"   "5225634"   "5613033"   "5729439"   "5925445"   "6091155").PN. OR ("6259608"). URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2005/08/23 10:01
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S5	4	S4 and (back adj fill\$4)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2005/08/23 10:04
S6	17684	S4 (flip-chip\$2)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2005/08/23 10:04
S7	226	S4 and (flip-chip\$2)	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2005/08/23 11:15
S8	0	("2003/0116347").URPN.	USPAT	OR	OFF	2005/08/23 10:42
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S10	2	"6384343".pn.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	OFF	2005/08/23 10:46
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CLAIMS

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[Claim(s)]

[Claim 1] It is the semiconductor device which is a semiconductor device which has the bump by whom both sides of a circuit pattern were established in the semiconductor device carried in the 1 main front face of the wiring film covered with the insulator layer, and said wiring film, the electrode pad which cuts and lacks said a part of insulator layer of the other main front face of said wiring film, and exposes said circuit pattern, and said electrode pad, and is characterized by said electrode pad being elliptical [ long in the direction of a core of said semiconductor device ].

[Claim 2] Said electrode pad is a semiconductor device according to claim 1 characterized by estranging mutually, preparing more than one annularly, and preparing said bump to said two or more electrode pads, respectively.

[Claim 3] Said bump is a semiconductor device according to claim 1 or 2 characterized by being the alloy of lead and tin.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to the semiconductor device which has a bump about a semiconductor device.

[0002]

[Description of the Prior Art] Conventionally, in the semiconductor device of the structure of having the external terminal (henceforth a solder bump) of the shape of a bump which becomes by metal low material, such as eutectic solder, a reflow of the metal low material was carried out for metal low material to the electrode pad of the flexible wiring film which is a semiconductor device base at the temperature more than the melting point of metal low material a tack welding opium poppy and after that, and the solder bump was formed and it had connected.

[0003] The conventional wiring film 1 became the structure which made both sides of copper wiring the electric insulation with the polyimide film, as shown in drawing 4 (b), in order that it might form an external terminal in copper wiring connected with the semiconductor device 5, opened the circular aperture as shown in covering polyimide 4 by etching at drawing 4 (a), and had formed the electrode pad 2.

[0004] In order to form the solder bump 3 for external terminals, flux with comparatively high adhesion, such as rosin system flux, is applied to the front face of the wiring film 1 by the dispenser, the spin coat, or printing, and the solder ball which made solder spherical is carried in an electrode pad using a vacuum pincette. Then, it heat-treats, a solder ball is connected to an electrode pad, and the spherical solder bump 3 is formed. Moreover, in order to form a detailed solder bump, the adhesion of flux performs a tack welding opium poppy and heat-treatment for the piece of solder of the shape of a cylinder pierced using punch and a dice from ribbon-like solder to an electrode pad, solder is connected to an electrode pad, and the approach of forming the spherical solder bump 3 is taken.

[0005]

[Problem(s) to be Solved by the Invention] By this conventional solder bump, as shown in drawing 5, when it mounted in a printed circuit board, there was a trouble that a crack 10 occurred according to the difference of the thermal expansion of a semiconductor device 5 and a printed circuit board 8 in order that stress may concentrate on the solder bump's 3 root.

[0006] Although it is possible to enlarge a solder bump's plane-of-composition product, and to raise reinforcement as a cure which solves this problem, it is difficult to demand to correspond to the electrode of a detailed pitch and to only enlarge diameters of a design top electrode pad, such as a circuit pattern, in connection with the densification of electronic parts.

[0007] Moreover, the approach which the conductive layer by the ingredient with small Young's modulus with the high and melting point is formed on both sides of a predetermined metal layer on the pad formed in electrical-part front faces, such as a semiconductor chip, to solder, and forms the solder on a bump on the conductive layer is considered as a solder bump's measures against a crack are taken and it is indicated by JP,3-222334,A.

[0008] However, this approach is difficult to apply to a wiring film about the bump structure of a flip chip, and since the number of production processes increases, cost will become high.

[0009] The purpose of this invention is to offer the semiconductor device which prevents easily the crack generated by the solder bump after mounting in low cost.

[0010]

[Means for Solving the Problem] The semiconductor device by this invention is the semiconductor device which has the bump by whom both sides of a circuit pattern were established in the semiconductor device carried in the 1 main front face of a wiring film and the above-mentioned wiring film covered with the insulator layer, the electrode pad which cuts and lacks a part of above-mentioned insulator layer of the other main front face of the above-mentioned wiring film, and expose the above-mentioned circuit pattern, and the above-mentioned electrode pad, and it carries out that the above-mentioned electrode pad is elliptical [ long in the direction of the above-mentioned semiconductor device of a core ] as the description.

[0011] Preferably, the above-mentioned electrode pad of each other is estranged, and are prepared annularly, and the above-mentioned bump is characterized by being prepared to two or more above-mentioned electrode pads, respectively. [ two or more ]

[0012]

[Function] Since an elliptical electrode pad long in the direction of a core of a semiconductor device makes large in the expansion direction of a semiconductor device a bump's plane-of-composition product formed at this electrode pad, at the time of printed circuit board mounting, it can ease the stress generated according to the difference of the coefficient of thermal expansion of a semiconductor device and a printed circuit board, and can reduce a bump's crack initiation at the same cost as usual.

[0013]

[Embodiment of the Invention] Next, this invention is explained with reference to a drawing that the above of this invention and the other purposes, and the description should be made clear.

[0014] Drawing 1 is the top view showing an example of the operation gestalt of this invention.

Drawing 2 (a) is the partial enlarged drawing of one electrode pad 2 part among the operation gestalten shown in drawing 1 . Drawing 2 (b) is the sectional view which met the A-A line of drawing 2 (a).

[0015] The semiconductor device of this invention is a semiconductor device which has a semiconductor device 5, the wiring film 1, and the solder bump 3, as shown in drawing 2 (b). A semiconductor device 5 It connects with the circuit pattern of the wiring film 1 electrically, and is carried in the wiring film 1. The wiring film 1 Both sides of a circuit pattern are insulated by the insulator layer, and it has two or more solder bumps 3, and the solder bump 3 cuts and lacks a part of insulator layer (covering polyimide 4), and is prepared in two or more electrode pads 2 formed by exposing a circuit pattern. The electrode pad 2 is elliptical [ long in the direction of an abbreviation core of a semiconductor device ], as shown in drawing 1 R> 1 and drawing 2 (a), respectively, is estranged and is arranged annularly. [ each other ]

[0016] Drawing 3 is the enlarged drawing showing the formation approach of the solder bump of this operation gestalt.

[0017] In order to form the solder bump 3 for external terminals, some covering polyimide film is cut and lacked and the elliptical electrode pad 2 is formed. Furthermore, the flux 7 with comparatively high adhesion, such as rosin system flux, is applied to the front face of the wiring film 1 by the spin coat or printing, and temporary attachment of the piece 6 of solder pierced using punch and a dice from ribbon-like solder is carried out according to the adhesion of flux 7 at the elliptical electrode pad 2. Then, it heat-treats, as shown in drawing 3 (c), and solder is connected to the electrode pad 2, and the ellipse ball-like solder bump 3 is formed.

[0018] The magnitude of 100 micrometers in the diameter of 150 micrometers and thickness and the electrode pad 2 of the magnitude of the piece 6 of solder in this example is the 80 micrometers of the directions of a minor axis, and the 160 micrometers of the directions of a major axis.

[0019] the place which mounted the semiconductor device of this operation gestalt in the glass epoxy group plate with a thickness of 1.5mm, and performed the heat cycle test (-40-125 degrees C) -- near the interface of conventional 100 cycle extent to a solder bump, and an electrode pad -- a crack -- being

generated -- a defect -- becoming -- \*\*\*\* (12/30 defect) -- the defect stopped occurring up to 300 cycle [0020]

[Effect of the Invention] Since a plane-of-composition product becomes large to shearing force when this invention makes a solder bump's plane-of-composition product large in the expansion direction of a semiconductor device as explained above, the shearing force per unit area becomes small. Therefore, since the stress generated according to the difference of the coefficient of thermal expansion of a semiconductor device and a printed circuit board can be eased and the bonding strength of a semiconductor device and a printed circuit board can be raised when mounted in a printed circuit board, a solder bump's crack initiation decreases and mounting with the high dependability of connection can be realized.

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TECHNICAL FIELD

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PRIOR ART

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[Description of the Prior Art] Conventionally, in the semiconductor device of the structure of having the external terminal (henceforth a solder bump) of the shape of a bump which becomes by metal low material, such as eutectic solder, a reflow of the metal low material was carried out for metal low material to the electrode pad of the flexible wiring film which is a semiconductor device base at the temperature more than the melting point of metal low material a tack welding opium poppy and after that, and the solder bump was formed and it had connected.

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EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] By this conventional solder bump, as shown in drawing 5, when it mounted in a printed circuit board, there was a trouble that a crack 10 occurred according to the difference of the thermal expansion of a semiconductor device 5 and a printed circuit board 8 in order that stress may concentrate on the solder bump's 3 root.

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MEANS

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OPERATION

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[Translation done.]

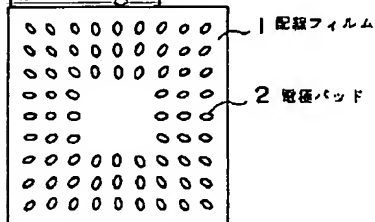
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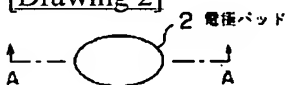
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## DRAWINGS

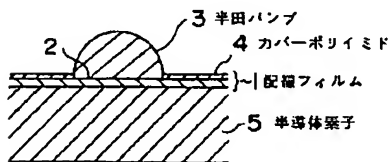
[Drawing 1]



[Drawing 2]

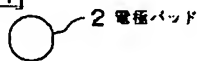


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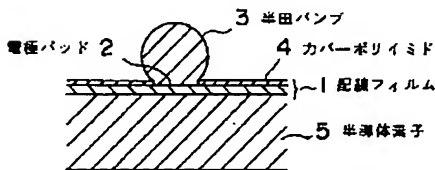


(b)

[Drawing 4]

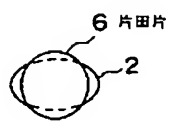


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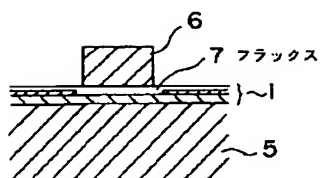


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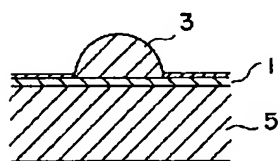
[Drawing 3]



(a)

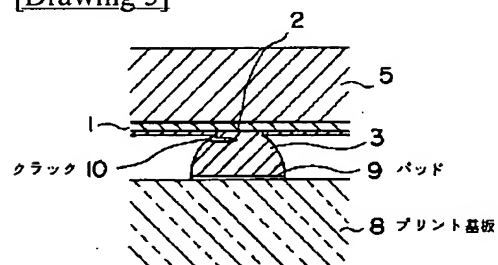


(b)



(c)

[Drawing 5]



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